

TECHNICAL MANUAL
UNIT, DIRECT SUPPORT, AND
GENERAL SUPPORT MAINTENANCE MANUAL
INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST
THROUGH DEPOT LEVEL
FOR

PALADIN MUZZLE VELOCITY SYSTEM M93

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HEADQUARTERS, DEPARTMENT OF THE ARMY

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Chapter	Page
SAFETY SUMMARY	SS-1
LIST OF ILLUSTRATIONS	v
LIST OF TABLES	vii
FOREWORD	viii
1 GENERAL INFORMATION AND SYSTEM DESCRIPTION	1-1
Section I General Information.....	1-1
Scope.....	1-2
Equipment Name and Part Numbers	1-2
Purpose of Equipment.....	1-2
Maintenance Forms and Procedures	1-2
Safety, Care, and Handling.....	1-5
Electrostatic Discharge (ESD) Awareness.....	1-5
Typical Prime Charge Sources	1-5
Prime Charge Carriers	1-5
Items to Avoid.....	1-5
Handling Unpackaged ESD Sensitive Items.....	1-5
Packaging and Labeling ESD Sensitive Items/Assemblies	1-5
Types of ESD Sensitive Devices.....	1-6
Army Adopted Configuration	1-6
Precautions within 20-foot (6-meter) Distance.....	1-6
Precautions within 50-foot (15-meter) Distance.....	1-6
Chairs.....	1-7
Corrosion Prevention and Control	1-7
Destruction of Army Materiel to Prevent Enemy Use.....	1-7
Decontamination of Components	1-7
Reporting Equipment Improvement Recommendations (EIR)	1-7
Section II Equipment Description	1-8
Equipment Features	1-8
Equipment Performance.....	1-8
Physical Characteristics.....	1-9
Power Requirements	1-9
Environmental Information	1-9
Principles of Operation	1-10
Muzzle Velocity Measurement and, Calculation	1-10
System Interconnection	1-11

TABLE OF CONTENTS (Cont.)

Chapter	Page
Section III Component Description.....	1-13
Components	1-13
Transceiver Assy.....	1-13
Mounting Bracket	1-13
Power and Data Cables.....	1-13
Transceiver Assy.....	1-14
General Description	1-14
RF Section	1-15
Doppler Amplifier.....	1-15
Power Supply Module	1-16
Muzzle Velocity Processor (MVP)	1-17
Mechanical Construction	1-20
RF Section	1-20
Back Cover Assembly	1-20
Mounting Bracket	1-23
Power and Data Cables.....	1-24
1553 Termination	1-25
2 OPERATING INSTRUCTIONS	2-1
General.....	2-1
MV Min/Max Range.....	2-1
3 MAINTENANCE INSTRUCTIONS	3-1
General Instructions	3-3
Power and Data Cable (0.75-Meter), P/N 12979004.....	3-7
Power and Data Cable (5-Meter), P/N 12979005.....	3-13
1553 Termination, P/N 12979006	3-25
Bracket Assembly, P/N 12979003.....	3-29
Transceiver Assembly, P/N 12979002	3-33
4 UNPACKING AND INSTALLATION	4-1
General.....	4-1
Unpacking	4-1
Installation	4-1
Installation of Transceiver Assy on Gun	4-2
System Interconnection	4-2
5 PREPARATION FOR SHIPMENT	5-1
General.....	5-1
Shipping M93 MVS In Crates	5-1
Packing and Shipping M93 Units and Parts.....	5-1

TABLE OF CONTENTS (Cont.)

Chapter	Page
6 STORAGE.....	6-1
Preparation For Storage	6-1
Environment.....	6-1
Return To Service.....	6-1
Shipping	6-2
APPENDIX A - REFERENCES.....	A-1
General.....	A-1
Forms.....	A-1
Field Manuals	A-1
Technical Manuals	A-1
Miscellaneous Publications.....	A-2
APPENDIX B - MAINTENANCE ALLOCATION CHART (MAC).....	B-1
General.....	B-1
Maintenance Functions	B-1
Explanation of Columns In The MAC - Section II	B-2
Explanation of Columns In Tool And Test Equipment Requirements - Section III.....	B-3
Explanation of Columns In Remarks- Section IV.....	B-3
Maintenance Allocation Chart	B 5
APPENDIX C - REPAIR PARTS AND SPECIAL TOOLS LIST.....	C-1
Section I Introduction	C-1
General.....	C-1
RPSTL Description.....	C-1
Explanation of Columns (Sections II And III)	C-2
Explanation of Columns (Section IV)	C-6
How to Locate Repair Parts.....	C-8
Section II Parts List	C-9
Section III Special Support Equipment.....	C11-1
Section IV Cross-Reference Indexes	I-1

TABLE OF CONTENTS (Cont.)

Chapter	Page
APPENDIX D OVERHAUL PROCEDURES	D-1
General.....	D-1
Technical Support Requirements	D-2
Preshop Analysis	D-3
Transceiver Assembly, P/Ns Ay6707292-0, AY6707292-1 and AY6707292-2	D-7
Doppler Amplifier Circuit Card Assembly (CCA), P/N AY67065566-0	D-49
Power Supply Module, P/N AY6707291-0.....	D-63
Muzzle Velocity Processor (MVP) Circuit Card Assembly (CCA), P/N's AY6707288-0, AY6707288-1, and AY67010314	D-81
Electro-Magnetic Interference (EMI) Filter Module, P/ns AY6707289-1 and AY6707289-3.....	D-107
Microwave Test Equipment, Description and Calibration.....	D-113
APPENDIX E GLOSSARY	E-1
Abbreviations and Acronyms	E-1
Special Terms.....	E-3
APPENDIX F EXPENDABLE AND DURABLE ITEMS LIST	F-1
Scope.....	F-1
Explanation of Columns	F-1
APPENDIX G FORMS	G-1
FOLDOUT DIAGRAMS	FO-1

LIST OF ILLUSTRATIONS

Figure	Title	Page
1-1	M93 MVS Components	1-3
1-2	M93 MVS Interconnection.....	1-12
1-3	Transceiver Assy Simplified Block Diagram.....	1-14
1-4	Doppler Amplifier Module Simplified Block Diagram.....	1-15
1-5	Power Supply Module Simplified Block Diagram	1-16
1-6	MVP Simplified Block Diagram	1-18
1-7	Transceiver RF Section (Part of Transceiver Assy, P/N 12979002)	1-21
1-8	Transceiver Back Cover Assembly (Part of Transceiver Assy, P/N 12979002)	1-22
1-9	Mounting Bracket Assy, P/N 12979003.....	1-23
1-10	Power and Data Cables	1-24
1-11	1553 Termination, P/N 12979006	1-25
3-1	Power and Data Cable (0.75-Meter), P/N 12979004	3-11
3-2	Power and Data Cable (0.75-Meter), P/N 12979004, Connector Pin Locations.....	3-12
3-3	Power and Data Cable (0.75-Meter), P/N 12979004, Wiring Diagram.....	3-12
3-4	Power and Data Cable (5-Meter), P/N 12979005	3-16
3-5	Power and Data Cable Test Setup	3-18
3-6	Power and Data Cable Tester, P/N AY6707984-0, Schematic Diagram	3-19
3-7	Power and Data Cable (5-Meter), P/N 12979005, Wiring Diagram.....	3-21
3-8	Power and Data Cable (5-Meter), P/N 12979005, Connector Pin Locations.....	3-21
3-9	1553 Stub (Part of Power and Data Cable (5-Meter), P/N 12979005)	3-23
3-10	1553 Termination, P/N 12979006	3-28
3-11	Bracket Assembly, P/N 12979003	3-31
3-12	Bracket Assembly, P/N 12979003, Removal and Installation.....	3-32
4-1	M93 MVS Installation	4-2
C-1	M93 Muzzle Velocity System, P/N 12950995	C1-1
C-2	Transceiver Assy, P/N 12979002	C2-1
C-3	Power Supply Module, P/N AY6707291-0.....	C3-1
C-4	Power Supply CCA, P/N 6707290-0	C4-1
C-5	Doppler Amplifier CCA, P/N AY6706566-0	C5-1
C-6	EMI Filter Module, P/N AY6707289-1	C6-1
C-7	Muzzle Velocity Process, P/N AY6707288-0	C7-1
C-8	Bracket Assembly, P/N 12979003	C8-1
C-9	Power and Data Cable (0.75 Meter), P/N 12979004	C9-1
C-10	Power and Data Cable (5 Meter), P/N 12979005	C10-1
C-11	Special Support Equipment	C11-1

LIST OF ILLUSTRATIONS (Cont.)

Figure	Title	Page
D-1	Transceiver Assembly, AY6707292-0.....	D-12
D-2	Transceiver Assembly, AY6707292-1.....	D-15
D-3	Transceiver Assembly, AY6707292-2.....	D-19
D-4	RF Cable, P/N WA6706563	D-21
D-5	Transceiver Assembly Power Supply and Transmitted Frequency Test Setup	D-28
D-6	Transceiver Assembly Transmitted Power Test Setup.....	D-29
D-7	Transceiver Assembly Sensitivity Test Setup	D-30
D-8	Transceiver Assembly RF Section Test Fixture	D-31
D-9	Transceiver Assembly RF Section Test Fixture Schematic	D-32
D-10	Transceiver Assembly RF Section Test Cable	D-33
D-11	Transceiver Assembly Functional Test Setup	D-38
D-13	1553 Bus Simulator Schematic	D-39
D-15	Test Doppler Simulator Schematic.....	D-40
D-17	1553 Bus Simulator Cable	D-41
D-18	Test Cable	D-42
D-19	Communication Test Cable	D-43
D-20	Doppler Amplifier CCA, AY6706566-0, Components Location.....	D-51
D-21	Doppler Amplifier CCA Test Setup	D-52
D-22	Doppler Amplifier CCA Test Fixture	D-53
D-23	Doppler Amplifier CCA Test Fixture Schematic	D-54
D-24	Doppler Amplifier CCA, AY6706566-0, Troubleshooting Flowchart	D-58
D-25	Power Supply Module.....	D-66
D-27	Power Supply Module Test Fixture	D-70
D-28	Power Supply Module Test Fixture Schematic	D-71
D-29	Power Supply Module Adjustment Setup.....	D-74
D-30	MVP CCA, AY6707288-0.....	D-85
D-31	MVP CCA, AY6707288-1.....	D-87
D-32	MVP CCA, AY670010314.....	D-89
D-34	MVP CCA Test Fixture	D-91
D-35	MVP CCA Test Fixture Schematic.....	D-92
D-36	Signal Shape on Oscilloscope	D-94
D-37	DSP U34 Pinout to Schematic Cross Reference – Bottom View	D-103
D-38	EMI Filter Module, AY6707289-1	D-109
D-39	EMI Filter Module, AY6707289-3	D-110
D-40	Microwave Measurement Equipment Connection	D-115
D-41	Microwave Measurement Equipment Calibration Schematic	D-117
FO-1	Transceiver Harness Schematic Diagram	FO-3
FO-2	Doppler Amplifier CCA, P/N AY6706566-0, Schematic Diagram	FO-5
FO-3	Muzzle Velocity Processor CCA, P/N AY6707288-0, Schematic Diagram.....	FO-7
FO-4	Power Supply Module, P/N AY6707291-0, Schematic Diagram	FO-9
FO-5	Power and Data Cable (5-Meter), P/N 12979005, Schematic Diagram.....	FO-11

LIST OF TABLES

Table	Title	Page
1-1	M93 MVS Equipment Name and Part Numbers	1-2
1-2	Means of Static Charge Generation.....	1-5
1-3	Device Type And Range of ESD Susceptibility (Volts).....	1-6
3-1	Maintenance Schedule.....	3-3
3-2	Materials Required	3-4
3-3	MVS/AFCS Interface Troubleshooting	3-5
3-4	Test Equipment And Special Tools Required.....	3-7
3-5	Materials Required	3-8
3-6	Power and Data Cable (5-Meter), P/N 12979005, Wiring Table.....	3-10
3-7	Test Equipment And Special Tools Required.....	3-13
3-8	Materials Required	3-14
3-9	Fault Isolation Table	3-20
3-10	Test Equipment And Special Tools Required.....	3-25
3-11	Materials Required	3-26
3-12	Special Tools Required.....	3-29
3-13	Materials Required	3-29
D-1	Preshop Analysis Checklist.....	D-5
D-2	Test Equipment and Special Tools Required	D-8
D-3	Materials Required	D-9
D-4	M93 Transceiver Assembly Configurations	D-10
D-5	Transceiver Assembly RF Section Test Data Sheet.....	D-36
D-6	Transceiver Assembly Functional Test Data Sheet	D-45
D-7	Test Equipment and Special Tools Required	D-49
D-8	Materials Required	D-50
D-9	Doppler Amplifier CCA Test Data Sheet.....	D-56
D-10	Test Equipment and Special Tools Required	D-63
D-11	Materials Required	D-64
D-12	Power Supply Module Test Data Sheet	D-73
D-13	Resistors Selection List.....	D-75
D-14	Power Supply Module Adjustment Data Sheet.....	D-76
D-15	Test Equipment and Special Tools Required	D-82
D-16	Materials Required	D-82
D-17	MVP CCQ Configurations	D-83
D-18	MVP CCA Test Data Sheet.....	D-97
D-19	MVP CCA AY6707288-0 Programmed Components	D-103
D-20	MVP CCA AY6707288-1 Programmed Components	D-104
D-21	MVP CCA AY67010314 Programmed Components	D-104
D-22	Test Equipment and Special Tools Required	D-107
D-23	EMI Filter Module P/N AY6707289-1 and AY6707289-3 Continuity Test Data Sheet	D-111
D-24	Standard Measurement Equipment.....	D-114
D-25	Microwave Measurement Equipment.....	D-114
D-26	MME Calibration Data Sheet.....	D-119

FOREWORD

PURPOSE OF THIS MANUAL

This manual provides maintenance instructions for the M93 Paladin Muzzle Velocity System (MVS) to enable personnel to perform the various tasks necessary to maintain the system.

CONTENTS OF THIS MANUAL

This manual contains the following chapters:

Chapter 1	-	General Information and System Description
Chapter 2	-	Operating Instructions
Chapter 3	-	Maintenance Instructions
Chapter 4	-	Unpacking and Installation
Chapter 5	-	Preparation for Shipment
Chapter 6	-	Storage
Appendix A	-	References
Appendix B	-	Maintenance Allocation Chart
Appendix C	-	Repair Parts and Special Tools List
Appendix D	-	Overhaul Procedures
Appendix E	-	Glossary
Appendix F	-	Expendable and Durable Items List
Appendix G		Forms
Foldout Diagrams		

USE OF THIS MANUAL

The Table of Contents indicates chapter, section, paragraph title, and page number to facilitate location of information. Illustrations, tables, and diagrams are located throughout the manual to supplement the text material. Schematics and wiring diagrams are included to facilitate parts replacement, troubleshooting, and testing. The list of illustrations and tables indicates the number, title, and location.

RELATED PUBLICATIONS

Refer to Appendix A for a list of related publications.

COMMON TOOLS AND EQUIPMENT

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE), CTA 50-970 or CTA 8-100, as applicable to your unit.

SPECIAL TOOLS AND SUPPORT EQUIPMENT

There are no special tools required for the repair of the M93 MVS. Support equipment required and authorized for repair of the M93 MVS is listed in the maintenance allocation chart (MAC) (Appendix B).

TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE)

TMDE required and authorized for repair of the M93 MVS are listed in the maintenance allocation chart (MAC) (Appendix B).

REPAIR PARTS

Repair parts are listed and illustrated in Appendix C of this manual.

CHAPTER 1

GENERAL INFORMATION AND SYSTEM DESCRIPTION

CHAPTER CONTENTS

	Page
Section I General Information.....	1-1
Section II Equipment	1-8
Section III Component Description.....	1-13

SECTION I. GENERAL INFORMATION

SECTION CONTENTS

Subject	Page
Scope	1-2
Equipment Name and Part Numbers.....	1-2
Purpose of Equipment.....	1-2
Maintenance Forms and Procedures.....	1-2
Safety, Care, and Handling	1-5
Electrostatic Discharge (ESD) Awareness.....	1-5
Typical Prime Charge Sources	1-5
Prime Charge Carriers.....	1-5
Items to Avoid.....	1-5
Handling Unpackaged ESD Sensitive Items.....	1-5
Packaging and Labeling ESD Sensitive Items/Assemblies	1-5
Types of ESD Sensitive Devices	1-6
Army Adopted Configuration	1-6
Precautions within 20-foot (6-meter) Distance.....	1-6
Precautions within 50-foot (15-meter) Distance.....	1-6
Chairs	1-7
Corrosion Prevention and Control	1-7
Destruction of Army Materiel to Prevent Enemy Use.....	1-7

Subject	Page
Decontamination of Components	1-7
Reporting Equipment Improvement Recommendations (EIR)	1-7

1.1 SCOPE.

This manual provides maintenance instructions for the M93 Paladin Muzzle Velocity System.

1.2 EQUIPMENT NAME AND PART NUMBERS.

Equipment names, part numbers, and military nomenclature are provided in Table 1-1.

Table 1-1. M93 MVS Equipment Name and Part Numbers

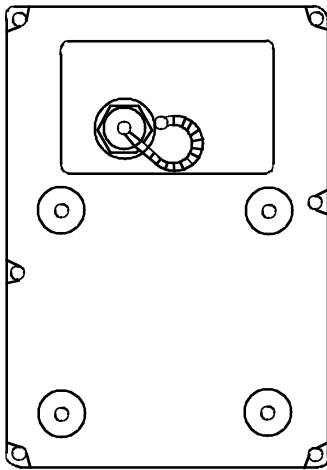
Component	Part Number	Military Nomenclature
Transceiver	12979002	Antenna Transceiver Assembly
Power and Data Cable (0.75-Meter)	12979004	Power and Data Cable (0.75-Meter)
Power and Data Cable (5-Meter)	12979005	Power and Data Cable (5-Meter)
Mounting Bracket	12979003	Mounting Bracket
1553 Termination	12979006	1553 Termination

1.3 PURPOSE OF EQUIPMENT

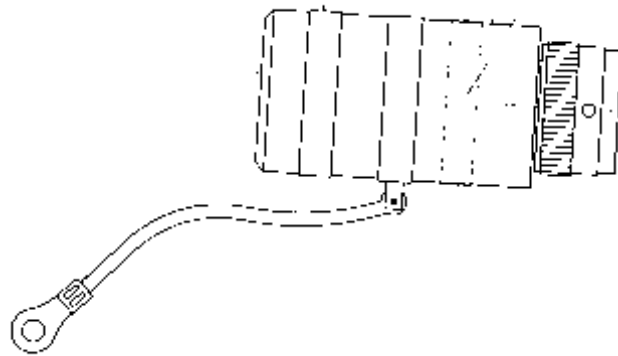
The purpose of the M93 (Figure 1-1) is to provide an accurate muzzle velocity reading for a projectile fired from a gun. The M93 MVS is designed to communicate measured projectile velocities, via a MIL-STD-1553B Data Bus to the M109A6 Paladin Automatic Fire Control System. This information can be used to provide a reasonable estimate of the average muzzle velocity for rounds to be fired for a new mission, thereby improving the possibility of a first-round hit on the target.

1.4 MAINTENANCE FORMS AND PROCEDURES.

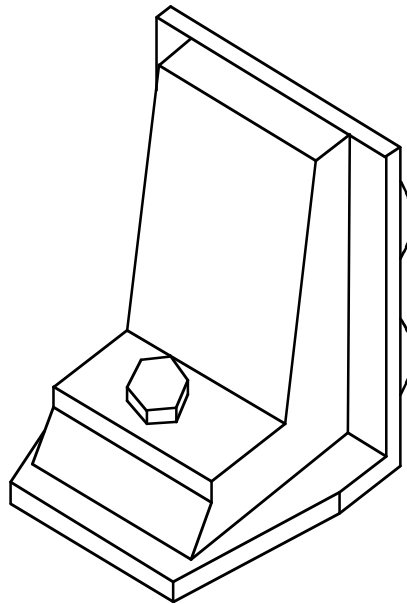
Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750, the Army Maintenance Management System (TAMMS), as contained in the Maintenance Management Update. A listing of maintenance forms is provided in Appendix A.



**TRANSCEIVER
(REAR VIEW)**

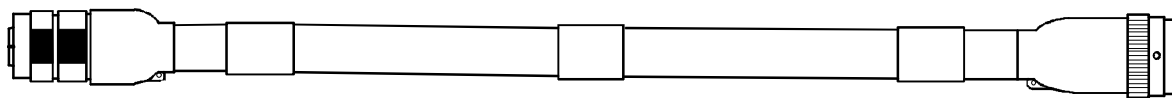


1553 TERMINATION

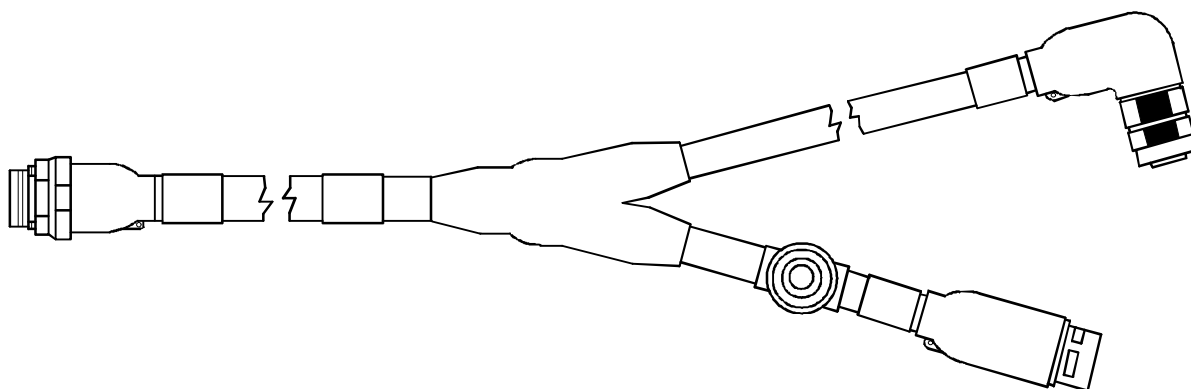


MOUNTING BRACKET

Figure 1-1. M93 MVS Components (Sheet 1 of 2)



POWER AND DATA CABLE (0.75-METER)



POWER AND DATA CABLE (5-METER)

Figure 1-1. M93 MVS Components (Sheet 2 of 2)

1.5 SAFETY, CARE, AND HANDLING.

1.5.1 Electrostatic Discharge (ESD) Awareness. It is essential to understand the nature of electrostatic discharge (ESD), what causes it, and the problems it can cause. This paragraph contains information on the areas of major concern.

1.5.2 Typical Prime Charge Sources. Means of generating electrostatic charges (voltage) and their relationship to relative humidity are shown in Table 1-2.

Table 1-2. Means of Static Charge Generation

Means of Static Generation	Electrostatic Voltages- 10-20 Percent Relative Humidity	Electrostatic Voltages- 65-90 Percent Relative Humidity
Walking across carpet	35,000	1,500
Walking on vinyl floor	12,000	250
Worker at workbench	6,000	100
Vinyl envelopes for work instructions	7,000	600
Common poly bag picked up from bench	20,000	1,200
Work chair padded with polyurethane foam	18,000	1,500

1.5.3 Prime Charge Carriers. Personnel are the prime charge carriers with the greatest potential of damaging ESD items. Activities such as walking, working at a table or bench, sliding on a chair, or simply combing one's hair can generate static charges of thousands of volts with high potential for damage to sensitive devices.

1.5.4 Items to Avoid. The following items will generate sufficient charges to damage sensitive items: all common plastics, spray cans, tape dispensers, heating guns, bubble packs, polystyrene cups, cigarette papers and wrappers, paint cans, stencil ink applicators, common poly bags and sheets, and plastic tape.

1.5.5 Handling Unpackaged ESD Sensitive Items. Never store or transport ESD sensitive components or assemblies outside of the protective packaging. The protective packaging should not be opened or removed until the item is to be installed in the next higher assembly. At this time, the technician should be grounded in an approved workstation. Avoid touching bare leads and contacts on sensitive material. Never use plastic solder suckers to remove soldered components from ESD sensitive assemblies. Use metallic or antistatic solder removal means.

1.5.6 Packaging and Labeling ESD Sensitive Items/Assemblies. After replacement of a sensitive circuit card assembly (CCA) or other subassembly into an instrument, the CCA that is to be returned for repair must be repackaged in ESD protective material to prevent further damage from handling and transit. For field returns, antistatic ziplock bags are available for CCAs and other small assemblies. The container with the ESD sensitive material warning label should also be used for returning defective material to ensure proper handling during shipment.

1.5.7 Types of ESD Sensitive Devices. ESD sensitive devices and information pertaining to susceptibility are listed in Table 1-3.

Table 1-3. Device Type an Range of ESD Susceptibility (Volts)

Device Type	Range of Susceptibility (Volts)
VMOS	30 to 1800
MOSFET	100 to 200
GaAsFET	100 to 300
EPROM	100
JFET	140 to 7000
SAW	150 to 500
OP AMP	190 to 2500
CMOS	250 to 3000
Schottky Diodes	300 to 2500
Film Resistors	300 to 3000
Bipolar Transistors	380 to 7000
ECL (PC Board Level)	500 to 1500
SCR	680 to 1000
Schottky TTL	1000 to 2500

1.5.8 Army Adopted Configuration. In general, a protective workstation must occupy a 10-foot (3-meter) square area and be cordoned off with yellow lines or other means of segregation. The area should be posted with signs identifying it as a static-free work area. This protective station may be used for packaging or by maintenance personnel for repairing sensitive devices, but not when applying power to the instrument for testing.

1.5.9 Precautions within 20-foot (6-meter) Distance. For purposes of initially established work-sites, the major controlled area shall be considered as that area within a 20-foot (6-meter) radius of the bench(es). Within this controlled area, the following should be excluded:

- a. Materials handling trucks, carts, and equipment.
- b. Conveyor drive mechanisms and moving belts.
- c. Sandblast and air-cleaning equipment.
- d. Paint spray booths and ventilating equipment.
- e. Storage of bulk common plastic materials such as large rolls of cushion wrapping material, loose fills, slab cushioning, or fastpacks.

1.5.10 Precautions within 50-foot (15-meter) Distance. A special hazard exists in areas where stretch and shrink wrapping operations are performed. This is also true where skin packaging, foam-in-place, and plastic bagging are conducted. These types of functions must be kept at least 50 feet (15 meters) away from static-protected worksites.

1.5.11 Chairs. Chairs are generally not recommended within the protected areas. If used, due to physical impairment of personnel, they must be of conductive construction, making good electrical contact with the grounded floor material, and must have conductive seat covers.

1.6 CORROSION PREVENTION AND CONTROL.

While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of the materials may be a corrosion problem. If a corrosion problem is identified, it should be reported using Standard Form 368, Product Quality Deficiency Report. Use of keywords such as "corrosion", "rust", "deterioration", or "cracking" will ensure that the information is identified as a CPC problem. Army users submit Product Quality Deficiency Report (SF 368) to:

Commander, U.S. Army Armament Research, Development and Engineering Center
ATTN: AMSTA-AR-WAW-C/Customer Feedback Center
Rock Island, IL 61299-7300
FAX: DSN 793-6653, Commercial (309) 782-6653
E-mail: gawqdrs@ria.army.mil

1.7 DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.

Only the commanding officer can give the order to destroy materiel to prevent enemy use. Refer to TM 750-244-6.

1.8 DECONTAMINATION OF COMPONENTS.

The components of the M93 MVS have been coated with a chemical agent resistant coating (CARC) to aid you in the decontamination (deliberate removal of a chemical agent hazard) by one or a combination of chemical treatments, evaporating with hot air absorbents, or other methods. There are two levels of decontamination.

- a. Partial - just enough contamination is removed or neutralized to allow soldiers to sustain operation.
- b. Complete - When contamination is reduced to a level that permits soldiers to operate for extended periods without wearing protective clothing; e.g., mask, gloves.

The application of CARC has improved the efficiency by which the decontamination process can be accomplished. Therefore, it is important that you maintain this coating through the proper application of paint, which contains CARC properties, whenever you apply paint. For additional information and instructions pertaining to nuclear, biological, and chemical (NBC) decontamination, refer to FM 3-5 (NBC Decontamination). Complete instructions regarding the application of CARC are provided in TM 43-0139 (Painting Instructions for Army Materiel).

1.9 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If your M93 MVS needs improvement, let us know. Send us an EIR. You, the user are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Product Quality Deficiency Report) and mail it to:

Commander, U.S. Army Armament Research, Development and Engineering Center
ATTN: AMSTA-AR-WEP/Customer Feedback Center
Rock Island, IL 61299-7300
FAX: DSN 793-6339, Commercial (309) 782-6339 or (309) 782-3065
E-mail: menkej@ria-army.mil